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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/558,669	11/30/2005	Zuyi Zhang	03500.018177.	8317

5514 7590 05/26/2009

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EXAMINER	
NGUYEN, VU ANH	

ART UNIT	PAPER NUMBER
1796	

MAIL DATE	DELIVERY MODE
05/26/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/558,669	ZHANG ET AL.	
	Examiner	Art Unit	
	Vu Nguyen	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office action is in response to the reply filed 03/20/2009. Claims 1-7 are pending in this application.

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over a combination of Ito et al. (WO 02/33709) and Nomora et al. (WO 03/041091) in view of Li et al. (WO 05/001037) for the reasons set forth in the Office action dated 12/23/2008. *Notes: US 7,160,968, US 7,214,756, and US 2007/0100078 are being used as equivalents of WO 02/33709, WO 03/041091, and WO 05/001037, respectively.*

Response to Arguments

3. Applicant's arguments filed 03/20/2009 have been fully considered but they are not persuasive. Essentially, the applicant alleges that the claimed membrane has unexpected results that are not obvious from the combination of the references. These allegedly unexpected results include improved heat resistance, enhanced conductivity over a wide range of temperature and humidity, and excellent resistance to water and methanol (Remarks, pages 2-3). As discussed in the Office action dated 12/23/2008, these improvements are not unexpected but are obvious from the combination of the

references. Ito teaches a membrane comprising a phosphoric acid-containing sulfonic acid-containing copolymer wherein the **membrane has high electric conductivity and excellent heat and chemical resistance**. Normora teaches a proton conducting membrane comprising a highly cross-linked siloxane network of organic-inorganic hybrid structure. The followings are also taught:

> A fuel cell, depending on the chemical reaction for its working principle, has a higher energy efficiency when it operates at higher temperature (i.e., 120°C or higher) (col. 2, lines 29-39). "It is a consensus that **production of sufficient power is difficult at low temperature**, and possible when temperature is increased to, e.g., 150°C or higher" (col. 2, lines 56-59). **Conventional sulfonated fluorinated resin-based membranes have a maximum allowable temperature of 80°C for stable operation for extended periods** (col. 2, lines 26-28). Attempts at increasing the heat resistance of proton-conducting membranes by using aromatic polymers have numerous drawbacks (col. 3). On the other hand, **membranes made of inorganic materials such as hydrolyzing/condensing acid-containing hydrolysable silyl compounds, though exhibiting good proton conductivity at high temperature**, are difficult to process and do not have stable structure at high temperatures as the membranes tend to be cracked (col. 4, lines 1-9). The disclosed membranes, being a hybrid structure, has **improved heat resistance, durability, dimensional stability, fuel barrier**

characteristics, and high proton conductivity at high temperature (col. 4, lines 46-52).

Clearly, cross-linked siloxane network has numerous advantages but, unless it is made of an organic-inorganic hybrid structure, it has the drawbacks of being difficult-to-process the membrane made thereof tends to be cracked. Li teaches hybrid organic-inorganic polymer electrolyte membrane wherein the membrane comprises Si-O-Si network. Li teaches that, unlike **conventional proton electrolyte membranes which can usually be operated below 80°C [0003] and are not thermally stable over 120°C, especially membranes containing sulfonic acid groups** [0004], the disclosed membranes are stable and have **good proton conductivity at high temperatures** [0051, 0039-0040].

4. The combination of the references clearly points to an electrolyte membrane comprising a hybrid organic-inorganic structure having Si-O-Si network and having phosphoric acid group in place of sulfonic acid group. Such membrane would have improved properties of chemical resistance, heat resistance, durability, dimensional stability, and high and stable proton conductivity at temperature above 80°C.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vu Nguyen whose telephone number is (571)270-5454. The examiner can normally be reached on M-F 7:30-5:00 (Alternating Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Vu Nguyen
Examiner
Art Unit 1796

/David Wu/
Supervisory Patent Examiner, Art Unit 1796